

The Impact of Knowledge Acquisition Methods on the Absorptive Capacity and Ambidextrous Innovation of Logistics Companies

Liu Lin*, Liu Zhen-zhen**, Fan Bao-Sen***, Jin Ying****, Woo Su-Han*****

Abstract

Under the background of global supply chain reconstruction and digital wave, Chinese logistics enterprises are facing the pressure of transformation from scale expansion to innovation driven. Based on the framework of resource-based theory (RBT) and dual innovation theory, this study focuses on the characteristics of the logistics industry, and constructs a theoretical model of external knowledge acquisition internal knowledge sharing absorptive capacity dual innovation. This study focuses on Chinese logistics enterprises, exploring the direct impact of acquire external knowledge and internal knowledge sharing on absorptive capacity, as well as the deeper relationship between absorptive capacity and ambidextrous innovation. The findings reveal that different methods of knowledge acquisition equally enhance innovation performance: both acquire external knowledge and internal knowledge sharing contribute to the improvement of absorptive capacity, thereby deepening research related to knowledge aspects in corporate innovation. Additionally, the study finds that absorptive capacity positively affects both exploratory and exploitative innovation, with a more significant impact on exploratory innovation. Exploitative innovation serves as a mediator between absorptive capacity and exploratory innovation. The research findings not only validate the knowledge circulation process within and outside the enterprise, but also deepen the relevant research on enterprise innovation issues at the knowledge level. On the other hand, they provide suggestions for enterprises to carry out effective external knowledge acquisition and internal knowledge sharing activities, promoting the improvement of enterprise innovation.

Keywords: acquire external knowledge, internal knowledge sharing, absorptive capacity, ambidextrous innovation, PLS

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I. Introduction

Innovation is crucial for leading development. The logistics industry also needs innovation in its development process, requiring enterprises to comprehensively transform and upgrade traditional logistics patterns across various levels and fields, including systems, technologies, services, and business models (Liu Ling, 2018). Knowledge is the most important resource for enterprises (Liu Jingdong & Dang Xinghua, 2013) and the foundation of innovation, being an indispensable key resource in the innovation process (Mao, 2020; Audretsch, 2020). Knowledge management can help enterprises successfully implement innovation strategies (Ferraris, 2021). Therefore, effectively acquiring knowledge becomes critical for enterprises to achieve sustainable development (Nonaka & Takeuchi, 1996). This necessitates continuous exploration and integration of internal and external knowledge, creating new knowledge, and broadening the internal knowledge base (Kogut & Zander, 1992). On one hand, enterprises must acquire knowledge from external stakeholders, known as "acquire external knowledge"; on the other hand, enterprises must engage in internal knowledge sharing activities, referred to as "internal knowledge sharing" (Tang Chaoying et al., 2018). Once knowledge resources enter the enterprise, they need to be effectively absorbed and utilized (Gilsing et al., 2008), which requires the enterprise's absorptive capacity to play a role. Logistics enterprises need to dynamically process heterogeneous knowledge resources for innovation purposes, helping them more effectively implement innovation strategies. Absorptive capacity is closely related to innovation (Qu Sunping et al., 2016). It is the ability of an enterprise to recognize, assimilate, and apply new knowledge, influenced by knowledge sources and prior knowledge, and it impacts the company's innovation (Cohen & Levinthal, 1990). Acquire external knowledge by enterprises benefits the development of new products and technologies, i.e., exploratory innovation (Lichtenthaler, 2013), and also aids in improving existing products and technologies, i.e., exploitative innovation (Cohen & Levinthal, 1990).

However, there is much debate over the choice of ambidextrous innovation. March (1991) argued that the relationship between exploratory and exploitative activities in innovation is incompatible. Conversely, some studies found that exploration and exploitation should complement and synergize with each other (Beckman et al., 2004). For instance, Gupta et al. (2006) suggested that exploratory and exploitative innovations in organizational innovation behavior are two different dimensions of a continuous spectrum that need to be studied in conjunction with the appropriate level of analysis. Therefore, this study further explores which type of innovation absorptive capacity influences more and deeply analyzes the impact of exploitative innovation on exploratory innovation, helping enterprises correctly handle the relationship between the two types of innovation. Furthermore, can enterprises process their knowledge through absorptive capacity to influence innovation? This study will expand the research on innovation in logistics enterprises at the knowledge level, deepen the understanding of knowledge circulation systems and innovation theories, and verify the causal relationship between innovation capabilities and activities. Additionally, with the emergence of concepts such as smart logistics, cloud warehousing, and supply chain digitalization, some logistics enterprises have introduced

new business forms and models. Currently, there is no research on technologically innovative logistics enterprises. The logistics industry in China indeed occupies an important position in the global supply chain, and its development speed and scale cannot be ignored. Therefore, in selecting the research subjects, this study conducted a questionnaire survey on Chinese logistics companies and analyzed the data using PLS-SEM. Aiming to propose innovative activity plans for logistics enterprises to achieve success and sustainable growth through organizational learning, and provide reasonable suggestions for maintaining the core competitiveness of the logistics industry.

II. Theoretical background

1. Absorptive capacity

The concept of absorptive capacity, as formulated by Cohen and Levinthal (1990), fundamentally transformed the way scholars understand organizational learning and innovation. Defined as a firm's ability to recognize the value of new external knowledge, assimilate it, and apply it for commercial purposes, absorptive capacity is not a static capability but one that evolves through continuous interaction between internal and external learning processes. The authors highlighted that prior related knowledge is critical, as it determines the firm's capacity to identify and integrate new information effectively.

A key insight from Cohen and Levinthal's work is the cumulative and path-dependent nature of absorptive capacity. Organizations that continuously engage in learning activities, both internally and externally, can build a richer knowledge base that enhances future absorptive efforts. This notion underscores the strategic importance of maintaining active knowledge acquisition behaviors over time.

In response to the growing complexity of knowledge environments, Zahra and George (2002) proposed a refined, process-oriented model that divides absorptive capacity into two subsets potential absorptive capacity and realized absorptive capacity. This model emphasizes that acquiring knowledge is only the first step; firms must also possess the organizational routines, structures, and culture to convert and leverage knowledge for innovation outcomes. According to this framework, firms with strong potential absorptive capacity may fail to innovate unless they also develop realized absorptive capacity capabilities.

Further theoretical development by Todorova and Durisin (2007) challenged and refined the linear process model proposed by Zahra and George, arguing for a recursive model of absorptive capacity. They contended that the processes of assimilation and transformation are not strictly sequential and that knowledge acquisition can also trigger reactivation or reinterpretation of previously held knowledge. This dynamic view aligns with the increasing need for firms to respond rapidly to complex, changing environments.

More recent studies have emphasized micro-foundations of absorptive capacity, focusing on individual and team-level capabilities. For instance, the ability of employees to absorb, interpret, and

apply knowledge is seen as a function of their cognitive capacity, social capital, and exposure to diverse knowledge sources. Additionally, organizational elements such as cross-functional collaboration, IT infrastructure, and learning orientation have been identified as key enablers of absorptive capacity (Flatten et al., 2011).

In the context of logistics companies, absorptive capacity becomes particularly critical due to the industry's reliance on real-time information, inter-organizational coordination, and technological agility. The rapid pace of digital transformation, customer demands for customization, and competitive pressures all necessitate robust absorptive mechanisms that allow logistics firms to adapt and innovate continuously.

In summary, absorptive capacity is a multidimensional, dynamic capability that enables firms to translate both internal and external knowledge into strategic advantage. It is deeply intertwined with organizational learning processes, innovation systems, and knowledge acquisition practices—making it a central construct in understanding how firms evolve in complex environments.

2. Knowledge Acquisition

In the framework of Knowledge Management Theory, knowledge is considered a strategic resource that underpins organizational learning and innovation. Knowledge acquisition—the process through which firms obtain knowledge—is a core component of effective knowledge management, particularly in dynamic industries such as logistics (Nonaka & Takeuchi, 1996; Kogut & Zander, 1992).

Knowledge acquisition comprises two primary dimensions: external knowledge acquisition and internal knowledge sharing. These two modes reflect different but complementary routes through which organizations build, renew, and leverage their knowledge base.

External knowledge acquisition involves identifying, accessing, and integrating knowledge from the external environment, including customers, suppliers, competitors, research institutions, and regulatory bodies. It is closely aligned with the concept of knowledge absorption, a subfunction of absorptive capacity (Cohen & Levinthal, 1990). Through boundary-spanning activities such as partnerships, market intelligence, and R&D collaborations, logistics enterprises can access diverse and novel information that enhances their innovation potential (Laursen & Salter, 2006).

According to Knowledge Management Theory, this process is not passive. Organizations must have mechanisms in place to scan their environment, evaluate the relevance of new knowledge, and assimilate it into their operational and strategic processes (Zahra & George, 2002). In fast-changing logistics sectors, access to emerging technologies and best practices from external sources is especially critical to maintaining competitiveness and adaptability.

While acquiring knowledge from external sources is crucial, leveraging internal knowledge sharing is equally important. This refers to the dissemination and circulation of knowledge across departments, teams, and hierarchical levels within the organization (Kwan & Cheung, 2006). Effective internal sharing promotes knowledge transfer, turning individual or localized expertise into collective organizational learning (Nonaka, 1994).

Internal knowledge sharing mechanisms—such as collaborative platforms, cross-training, communities of practice, and informal networks—facilitate the transformation of tacit knowledge into explicit knowledge, enabling it to be codified, retained, and reused. In Knowledge Management Theory, this process enhances the organization's memory and supports long-term innovation by allowing employees to recombine existing knowledge in new ways (Fan & Yun, 2016).

Together, these two knowledge acquisition methods shape a firm's absorptive capacity, enabling it to not only gather and store knowledge but to understand, contextualize, and apply it toward innovation. As such, effective knowledge management acts as a catalyst linking knowledge acquisition processes with superior innovation outcomes.

3. Ambidextrous Innovation

Ambidextrous innovation refers to an organization's simultaneous pursuit of two types of innovation: exploratory innovation (radical, risk-taking, future-oriented) and exploitative innovation (incremental, efficiency-focused, based on current capabilities). This concept was first systematically introduced by March (1991), who emphasized the inherent tension between exploration and exploitation—one seeking variation and novelty, the other favoring refinement and reliability.

From the perspective of knowledge management theory, ambidextrous innovation depends on how effectively an organization manages and utilizes its knowledge resources. Effective knowledge acquisition and sharing enable firms to explore new opportunities while exploiting existing knowledge bases. The theory suggests that different knowledge processes (acquisition, sharing, transfer) must be aligned with both innovation types to maximize performance (Nonaka & Takeuchi, 1996; Zahra & George, 2002).

Exploratory innovation involves activities such as experimenting with new technologies, entering unknown markets, or developing radically new products. It requires firms to access external, diverse, and often ambiguous knowledge, which stimulates creativity and risk-taking (Lichtenthaler, 2009; Freeman & Soete, 2009).

Exploitative innovation, in contrast, builds on existing knowledge and capabilities to refine processes, improve efficiency, or enhance current offerings. This form of innovation depends heavily on internal knowledge sharing, which fosters incremental improvements and operational excellence (Jansen et al., 2006).

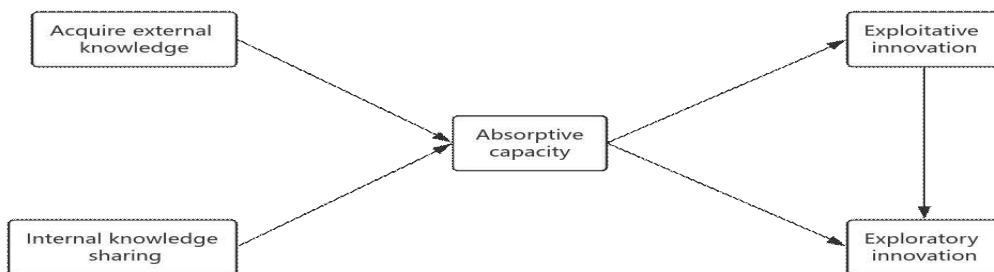
Although traditionally viewed as contradictory, growing research suggests that exploration and exploitation can coexist and reinforce one another under appropriate structural and cognitive mechanisms (Gupta et al., 2006; Lavie et al., 2011). Organizations with high absorptive capacity—the ability to identify, assimilate, and apply valuable knowledge—are better positioned to balance both innovation types (Sheng & Chien, 2016).

III. Research Model and Hypothesis Development

1. Hypothesis Development

The purpose of this study is to examine the relationship between knowledge acquisition methods—specifically, acquire external knowledge and internal knowledge sharing—and absorptive capacity, and to further investigate how absorptive capacity influences ambidextrous innovation, including both exploratory and exploitative innovation, in Chinese logistics companies. Based on the aforementioned literature, this study designs the following research model, as shown in the figure below.

<그림 1> The research model



Cohen and Levinthal (1990) were the first to clearly propose the concept of absorptive capacity, explaining the importance of knowledge acquisition for enhancing absorptive capacity. They emphasized that organizations enhance their innovation capabilities by continually accumulating acquire external knowledge, which is the core of knowledge acquisition.

Many scholars have subsequently suggested that enterprises have two ways of acquiring knowledge: acquire external knowledge and internal knowledge sharing (Liu Jingdong & Dang Xinghua, 2013; Fan Yanan & Yun Lexin, 2016; Nonaka, 1994). Through these two knowledge acquisition methods, enterprises integrate, store, transform, and apply new and old knowledge, thereby continuously increasing and updating their internal knowledge stock. This constant infusion of innovation sources maintains sufficient developmental momentum and effectively promotes the improvement of innovation performance.

What is the relationship between these two knowledge acquisition methods and absorptive capacity? Luo Shunjun (2015) found that acquire external knowledge significantly enhances a firm's absorptive capacity, which in turn influences the choice of knowledge acquisition modes in subsequent stages. Internal knowledge sharing accelerates the process from knowledge generation to application, thereby rapidly enhancing absorptive capacity. Furthermore, Zhao Dali et al. (2018) detailed various knowledge acquisition methods that

promote absorptive capacity. Hou Jiawen et al. (2023) later analyzed how internal and acquire external knowledge methods improve absorptive capacity. On one hand, cooperation with external stakeholders such as suppliers, customers, and research institutions allows enterprises to acquire various types of knowledge and information, obtaining innovative resources. These resources, once internalized, expedite the transformation and application of existing knowledge, increasing the utilization rate and enhancing absorptive capacity. On the other hand, dispersed and partial internal knowledge, when shared, can be understood at different levels and transformed according to application needs, thus impacting absorptive capacity.

H1: Acquire external knowledge has a significant positive impact on absorptive capacity.

H2: Internal knowledge sharing has a significant positive impact on absorptive capacity

March (1991) was among the first to propose the existence of two ambidextrous activities in enterprises: exploration and exploitation. Exploration refers to new possibilities, involving risk-taking, experimentation, flexibility, and innovation, while exploitation refers to improvements based on existing foundations, involving refinement, selection, production, and efficiency. Absorptive capacity strengthens the uniqueness of enterprise resources and capabilities, accelerates internal innovation, and enhances innovation capacity (Sheng, 2016). Utilizing external knowledge enriches the enterprise's knowledge base, enhances its ability to identify opportunities and threats, and alleviates the pressure of internal resource shortages. Absorbing external knowledge facilitates exploratory innovation, aiding in the development of new products and technologies (Lichtenthaler, 2013), as well as exploitative innovation, improving existing products and technologies (Cohen & Levinthal, 1990). Both exploratory and exploitative innovations originate from the deep exploration and utilization of key knowledge resources within and outside the organization (Freeman, 2009). Enterprises with insufficient technological and market advantages and internal knowledge shortages need to establish links with different stakeholders, leveraging strong external knowledge absorptive capacity to acquire and utilize market information and technical knowledge (Laursen, 2006).

H3: Absorptive capacity has a significant positive impact on exploitative innovation.

H4: Absorptive capacity has a significant positive impact on exploratory innovation.

To survive in a competitive environment, enterprises must engage in both exploitative and exploratory innovation (Un, 2010). Existing literature suggests that the two types of

innovation are incompatible (Lavie et al., 2011). However, other studies indicate that exploitative and exploratory innovations are linked and that exploitative innovation promotes exploratory innovation (Han Chen & Gao Shanxing, 2017). The formation of innovation capability is a long-term cumulative process (Zheng Bingyun et al., 2011). Enterprises need supplementary knowledge for exploitative innovation and complementary knowledge for exploratory innovation (Wei Jiang & Xu Lei, 2014). Compared to supplementary knowledge, enterprises require absorptive capacity to integrate and utilize complementary knowledge. Enterprises with strong absorptive capacity can better absorb and utilize complementary knowledge (Fores & Camison, 2016). Exploitative innovation continuously improves existing technologies and innovation systems, enhancing innovation capabilities. When exploitative innovation reaches a certain level, enterprises gain the capability to carry out exploratory innovation naturally (Zheng Bingyun et al., 2011). Therefore, absorptive capacity has a greater impact on exploratory innovation compared to exploitative innovation, with exploitative innovation acting as a mediator between absorptive capacity and exploratory innovation (Qu Sunping et al., 2018).

H5: Absorptive capacity has a greater impact on exploratory innovation compared to exploitative innovation.

H6: Exploitative innovation mediates the relationship between absorptive capacity and exploratory innovation.

2. Variable Measurement and Design

The research variables in this study include internal knowledge sharing, acquire external knowledge, exploratory innovation, exploitative innovation, and absorptive capacity. A 7-point Likert scale was primarily used to measure the variables in the model. The selection of scales was based on previously used measures that ensured reliability and validity. Respondents were asked to indicate the extent to which they agreed with each statement in relation to their company's actual situation and project descriptions, ranging from "strongly disagree" to "neutral" to "strongly agree," with corresponding scores from 1 to 7.

To ensure good content validity of the questionnaire, this study summarized and ordered the more reliable and valid scales repeatedly verified in previous studies. The measurement scales for the main research variables were designed as follows:

Acquire External Knowledge: This scale includes four items, mainly referencing the studies of Jiang Xu et al. (2008), Fan Yanan et al. (2016), and Tsang, E. W. (2002), and considers external knowledge from customers, partners, competitors, and third-party institutions.

Internal Knowledge Sharing: This scale includes four items, drawing from the research of

Fan Yanan et al. (2016) and Kwan, M. M., & Cheung, P. K. (2006), with modifications. It describes the sharing of knowledge, experiences, and skills among employees, their willingness to help each other solve problems, the sharing of knowledge when making decisions, and the dissemination of knowledge through collective activities.

Exploitative Innovation: Reflecting Jansen et al. (2006), this scale measures the focus on innovation in situations where the company often emphasizes innovation. It includes items on modifying existing technologies or skills to meet current needs and improving the applicability of existing technologies or skills in multiple related business areas.

Exploratory Innovation: Also based on Jansen et al. (2006), this scale includes items such as the company's frequent attempts to apply new technologies or skills that are not yet mature and carry certain risks.

Absorptive Capacity: Referencing Jansen et al. (2005) and Zahra and George (2002), this scale measures the ability to quickly recognize whether new external knowledge is useful to the company, among other items. The details are shown in Table 1.

<Table 1> Measurement items

Variables	Items	Source
Acquire external knowledge	We learn a lot about product functionality in our interactions with customers.	Jiang et al. (2008), Fan et al. (2016), and Tsang, E. W. (2002)
	We learn a lot about product design in our dealings with customers.	
	We learn a lot about the manufacturing process of our products in our dealings with customers.	
	We learn a lot about product development techniques in our dealings with customers.	
Internal knowledge sharing	I frequently proactively share professional knowledge and practical experience with colleagues during work.	Fan Yanan et al. (2016) and Kwan, M. M., & Cheung, P. K. (2006)
	I willingly provide suggestions and assistance to colleagues when they encounter work-related challenges.	
	I promptly share relevant information I possess when the team makes important decisions.	
	I prefer disseminating valuable work methods through collective activities such as departmental meetings or training sessions.	
Exploratory innovation	Companies often try new technologies/skills that are immature and risky.	Jansen et al. (2006)
	Companies often try to take risks to develop new technologies or products.	
	Companies often try to develop new target markets for which they have no relevant marketing experience.	
	The company often tries business strategies and management methods that other companies in the same industry have not adopted.	
Exploitative innovation	Companies often adapt existing technologies/skills to suit current needs.	Jansen et al. (2006)
	The company strives to improve the applicability of existing	

	technologies/skills in multiple related business areas.	
	The company often leverages existing technologies/skills to increase the functionality and variety of products/services.	
	The company often refines the existing business experience and applies it to the current business.	
Absorptive capacity	Ability to quickly identify whether new external knowledge is useful to the company.	Jansen et al. (2005); Zahra and George (2002)
	Frequent exchanges with other companies to acquire new knowledge.	
	Ability to quickly analyse and understand changing market demands.	
	Ability to quickly understand external technology/service opportunities.	

IV. Research Methods and Results

1. Data

To verify the causal relationships in the model, a survey was conducted. When randomly selecting sample enterprises, the following principles were primarily adopted: (1) the main business operations of the enterprise should be in logistics and transportation, (2) the enterprise must have been in operation for more than three years, a 3-year operation cycle can eliminate high-risk fluctuations in the start-up stage and ensure that the data reflects the operational characteristics of mature enterprises, and (3) the enterprise must have more than ten employees, enterprises with more than 10 employees usually have standardized management systems that can provide more reliable human capital management data. To ensure the authenticity of the questionnaire and the reliability of the data, we first conducted in-depth interviews with key managers of three logistics companies. Based on these interviews and a review of academic literature, we designed the initial draft of the questionnaire. Subsequently, managers from three other logistics companies were selected for a pilot study. Based on their suggestions, some deficiencies were corrected, and the final version of the questionnaire was determined. A total of 400 questionnaires were distributed, and 323 were returned. Excluding 74 questionnaires that did not belong to logistics enterprises and 28 incomplete questionnaires, 221 questionnaires were deemed valid for this study.

To enhance the validity and reliability of the survey instrument, the initial design process involved conducting in-depth interviews with senior managers from three logistics firms. Insights derived from these interviews, in conjunction with a comprehensive review of relevant academic literature, informed the development of the preliminary questionnaire. A subsequent pilot study was then carried out with managers from three additional logistics companies, whose feedback led to revisions that improved clarity, relevance, and measurement accuracy.

A total of 400 questionnaires were distributed across the target population, yielding 323 responses. After excluding 74 responses from firms outside the logistics industry and 28 incomplete questionnaires, a final dataset of 221 valid responses was retained for empirical analysis. The focus on Chinese logistics enterprises ensures contextual specificity and enhances the applicability of findings within the regional industry landscape.

2. SEM model

The tests include measurement model testing and structural model testing, and measurement model testing includes reliability testing and validity testing. In terms of reliability test, the Cronbach's α reliability coefficient and composite reliability results show that each latent variable has good reliability; the reliability results of the indicators in the following table show that each indicator is greater than 0.7. In terms of validity test, the average variance extraction value (AVE value) of each latent variable was greater than 0.5, and the model passed the convergent validity test. The AVE value of each latent variable is greater than the squared value of the correlation coefficient between latent variables, which conforms to the assumption of the Fornell-Larcker criterion, and the model passes the discriminant validity test; the factor loading of each item is higher than all its cross-loading, and the model passes the discrimination test again.

<Table 2> Reliability and validity analysis results

	Cronbach's Alpha	rho_A	Composite reliability	AVE
Internal knowledge sharing	0.917	0.930	0.941	0.800
Acquire external knowledge	0.918	0.945	0.942	0.802
Exploratory innovation	0.932	0.933	0.952	0.831
Exploitative innovation	0.919	0.920	0.943	0.805
Absorptive capacity	0.901	0.906	0.931	0.772

The exploratory factor analysis results of this study are shown in Table 3. Mainly using principal component analysis and variance maximization orthogonal rotation. From the results, it can be seen that the cumulative common variance explained by the five factors reaches 77.4%, and the factor loadings of all items are greater than 0.5, indicating that these variables have good validity and can be used for hypothesis testing analysis.

<Table 3> Exploratory factor analysis results

Variables	ITEM	F1	F2	F3	F4	F5
AEK	Q1	0.823	0.121	0.184	0.092	0.153
	Q2	0.851	0.112	0.139	0.074	0.162
	Q3	0.793	0.093	0.214	0.123	0.134

	Q4	0.834	0.132	0.172	0.083	0.191
IKS	Q5	0.093	0.873	0.112	0.134	0.082
	Q6	0.112	0.912	0.094	0.072	0.124
	Q7	0.084	0.842	0.124	0.104	0.063
	Q8	0.143	0.891	0.081	0.113	0.092
ERI	Q9	0.173	0.104	0.882	0.053	0.132
	Q10	0.152	0.083	0.923	0.072	0.114
	Q11	0.192	0.124	0.853	0.093	0.144
	Q12	0.224	0.113	0.812	0.112	0.173
ETI	Q13	0.083	0.134	0.063	0.862	0.124
	Q14	0.112	0.094	0.042	0.894	0.103
	Q15	0.074	0.143	0.081	0.913	0.084
	Q16	0.104	0.112	0.072	0.843	0.131
AB	Q17	0.164	0.072	0.124	0.113	0.834
	Q18	0.184	0.103	0.142	0.094	0.882
	Q19	0.152	0.063	0.104	0.132	0.853
	Q20	0.213	0.082	0.162	0.081	0.812
CVE	77.40%					

To clarify the correlation between variables, This experiment conducted correlation analysis between five variables: external knowledge acquisition, internal knowledge sharing, exploitative innovation, exploratory innovation, and absorptive capacity, as shown in Table 4. It is evident from the table that the correlations between the variables are significant, indicating that the variables in this study have a high level of correlation. The results of the correlation analysis preliminarily validated the hypothesis proposed in this study.

<Table 4> Correlation coefficients of variables

Var	1	2	3	4	5
AEK	1				
IKS	0.38***	1			
ERI	0.45 ***	0.31**	1		
ETI	0.22*	0.49***	0.21*	1	
AB	0.61 ***	0.35**	0.52***	0.25*	1

3. Hypothetical testing

The PLS-SEM structural model test includes examining the goodness of fit (R^2) and the significance of path coefficients. As shown in the following table, R^2 values should be greater than the minimum threshold of 0.1. Higher R^2 values indicate stronger explanatory power. Generally, the model demonstrates adequate explanatory power. The SRMR value of 0.052 is less than 0.08, indicating excellent model fit. The PLS-SEM model in this study

includes five paths, all of which are significant. Hypotheses 1, 2, 3, and 4 are confirmed. The detailed results are as follows:

<Table 5> Path analysis results

	Path	T value
Internal knowledge sharing -> Absorptive capacity	0.462***	7.510
Acquire external knowledge -> Absorptive capacity	0.139*	2.170
Exploitative innovation -> Exploratory innovation	0.420***	5.866
Absorptive capacity -> Exploratory innovation	0.401***	5.232
Absorptive capacity -> Exploitative innovation	0.649***	12.089
R2		
Exploratory innovation	0.555	
Exploitative innovation	0.422	
Absorptive capacity	0.289	
Model fit		
SRMR	0.052	
* p<0.05, ** p<0.01, *** p<0.001, two-sided test, () is t value		

4. Testing the Mediating Effect

The table below shows the direct effects of absorptive capacity on exploitative and exploratory innovation. The coefficient for exploratory innovation is greater than that for exploitative innovation, and both effects are significant, confirming Hypothesis 5. Additionally, in the absorptive capacity–exploitative innovation–exploratory innovation path, the coefficient is positive and significant, thus supporting Hypothesis 6.

<Table 6> Mediating effect analysis results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Absorptive capacity ->Exploratory innovation	0.732	0.733	0.053	13.866	0.000
Absorptive capacity ->Exploitative innovation	0.711	0.711	0.059	12.086	0.000
Absorptive capacity ->Exploitative innovation ->Exploratory innovation	0.307	0.305	0.072	4.277	0.000

V. Conclusions

Based on an empirical study of 221 Chinese logistics companies, this paper uses the PLS-SEM analytical method to delve into the relationship between knowledge acquisition methods, absorptive capacity, and ambidextrous innovation. The study found that both external knowledge acquisition and internal knowledge sharing significantly positively impact a company's absorptive capacity, thereby enhancing innovation performance. This indicates that an organization's capability to transform knowledge is closely related to the acquisition of external knowledge and the sharing of internal knowledge. Moreover, absorptive capacity has a more significant positive effect on innovation, especially exploratory innovation, highlighting the key role of absorptive capacity in different types of innovation activities. The research results not only verify the process that knowledge inside and outside the enterprise affects the absorptive capacity, but also further explore the complex relationship between absorptive capacity, exploitative innovation and exploratory innovation, and more innovatively reveal the differential influence mechanism of absorptive capacity on innovation types. On the other hand, they provide suggestions for enterprises to carry out effective external knowledge acquisition and internal knowledge sharing activities, and promote the improvement of enterprise innovation. Implications for logistics companies are as follows.

First, The Importance of Integrating Internal and External Knowledge. Logistics companies should recognize that innovation stems not only from internal R&D but also from the acquisition of external knowledge, which is equally crucial. Companies should actively establish cooperative relationships with suppliers, customers, research institutions, and others, acquiring and absorbing new knowledge through collaborative learning and technological exchanges to promote corporate innovation activities.

Second, Promoting Internal Knowledge Sharing. Enterprises should encourage communication and collaboration across departments and levels, establish knowledge-sharing platforms, and facilitate the dissemination of best practices and innovative thinking, thereby improving overall innovation efficiency.

Third, Strengthening Absorptive Capacity. Logistics companies should invest in employee training and learning development, enhancing their ability to identify, integrate, and apply knowledge, thus strengthening the company's absorptive capacity and driving the realization of innovation outcomes.

Limitations and future research are as follows.

Although this study provides in-depth insights into the relationship between knowledge acquisition, absorptive capacity, and ambidextrous innovation in logistics companies, it also has some limitations. Firstly, the study sample is limited to Chinese logistics companies and may not fully represent the global logistics industry. Future research could consider cross-cultural and cross-national comparative analyses to enhance the universality and applicability of the study.

Secondly, this study mainly focuses on the impact of knowledge acquisition and absorptive capacity on innovation but does not delve into other factors that may affect innovation, such as corporate culture, leadership style, and market environment. Subsequent research could consider these factors

comprehensively to obtain a more comprehensive innovation influence mechanism.

Lastly, this study uses cross-sectional data for analysis, which cannot fully capture the dynamic relationship between knowledge acquisition, absorptive capacity, and innovation over time. Future research could adopt longitudinal research designs to track the innovation process of companies at different stages, revealing more complex innovation dynamics.

Through these supplements and suggestions, we hope to provide a more comprehensive and in-depth understanding and guidance for the innovation management of logistics companies, and also provide a clear direction for subsequent research.

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지식 획득 방법이 물류 회사의 흡수 능력과 양면성 혁신에 미치는 영향

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국문초록

글로벌 공급망 재구성과 디지털화의 터전에 중국 물류 기업은 규모 확장에서 혁신 주도로의 전환 압박을 겪고 있다. 자원기반 이론(RBT)과 양면성 혁신 이론 바탕으로, 본 연구는 물류 산업의 특성을 고려하여 외부 지식 획득-내부 지식 공유-흡수 능력-양면성 혁신 이론 모형을 구축했다. 따라서 본 연구는 중국 물류 기업을 대상으로 외부 지식 습득과 내부 지식 공유가 흡수 역량에 미치는 직접적인 영향과 흡수 역량과 양면성 혁신 간의 심층적인 관계를 탐구하였다. 연구 결과는 다양한 지식 습득 방법이 혁신 성과를 동등하게 향상시킨다는 것을 보여주었다. 외부 지식 습득과 내부 지식 공유 모두 흡수 역량의 향상에 기여하여 기업 혁신과 관련된 지식 측면의 연구를 심화시켰다. 또한, 흡수 역량이 탐색적 혁신과 활용적 혁신 모두에 긍정적인 영향을 미치며, 특히 탐색적 혁신에 더 큰 영향을 미친다는 것을 발견하였다. 활용적 혁신은 흡수 역량과 탐색적 혁신 사이의 매개 역할을 한다. 본 연구 결과는 기업 내·외부 지식 습득의 유효성을 실증적으로 검증함으로써, 지식 기반 기업 혁신 이론을 심화시켰다. 특히 외부 지식 획득과 내부 지식 공유 활동의 효과적 운영을 위한 전략적 제안을 제시함으로써, 기업 혁신을 향상에 기여할 것으로 기대된다. 이는 기업 혁신 연구 분야에서 지식 관리 접근의 중요성을 재확인하는 동시에, 실무적 적용 가능성을 보여주는 의미 있는 연구 성과다.

주제어: 외부 지식 취득, 내부 지식 공유, 흡수 능력, 양면성 혁신, PLS

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